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CASE REPORT

Gradual Reduction of Chronic Fracture Dislocation of the Ankle Using Ilizarov/Taylor Spatial Frame

Nazzar Tellisi · Jonathan T. Deland, MD · S. Robert Rozbruch, MD

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Abstract With the advances in trauma care, chronic fracture dislocation of the ankle is not a condition commonly seen in modern clinical practice. When encountered, it can be difficult to preserve the ankle joint. We present a case of a 65-year-old female, with a chronic fracture dislocation of the ankle. The ankle joint was subluxated with posterior translation of the talus, displacement of the posterior malleolus fragment, and a distal fibula fracture. A minimally traumatic approach was devised to treat this complex fracture dislocation which included gradual reduction of the ankle with a Taylor spatial frame, followed by stabilization with internal fixation and removal of the frame. Bony union and restoration of the ankle joint congruency was achieved.

Keywords ankle fracture · ankle dislocation · neglected ankle fracture · Ilizarov · Taylor spatial frame

Introduction

The treatment of a neglected ankle fracture dislocation represents a challenge to the treating surgeon. The main aim is to restore the normal anatomy with the goal of preserving the ankle joint. Conventional approaches to mobilize the fracture and to relocate the talus would require extensive dissection that can compromise the blood supply to the fracture site and the joint surface. This can prove to be very traumatic to the ankle joint with unpredictable clinical results [4]. Achieving anatomical reduction in delayed situations with ankle fracture dislocation usually involves corrective osteotomies around the ankle joint [11]. Acute reduction can traumatize the skin and neurovascular supply to the foot. Despite all this, achieving anatomical reduction is unpredictable [9], and failure to restore the ankle bony anatomy is associated with poor outcome [1, 4].

Case report

We present a 65-year-old female with a previously neglected fracture dislocation of the ankle sustained 6 weeks prior. The clinical examination showed malalignment of the ankle with a preserved soft tissue envelope. She was unable to bear weight on the affected extremity due to pain. Radiographic review showed subluxation of the ankle joint with posterior translation and external rotation of the talus, displacement of the posterior malleolus fragment, and a distal fibular fracture (Fig. 1a, b).

A two-stage minimally traumatic approach was planned to treat this problem. The first stage involved a limited open surgery to osteotomize the partially healed bony fragments. A lateral approach was used. The malunited fibula was osteotomized. The displaced posterior malleolus was mobilized through the fibula fracture. At this point, manual reduction of the ankle was still not possible.

A Taylor spatial frame (TSF; Smith and Nephew, Inc., Memphis, TN, USA) was applied to enable gradual reduction (Fig. 2a, b). We used a *rings-first total residual method* [3, 7, 8]. A 155-mm ring was attached to the mid-distal third of the leg. This was stabilized with a tensioned 1.8-mm wire placed perpendicular to the axis of the tibia, and three additional half-pins were inserted using cubes. Next, a 155-mm foot ring was applied to the foot and in line with the position of the

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Each author certifies that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

N. Tellisi (✉) · J. T. Deland, MD · S. R. Rozbruch, MD
Hospital for Special Surgery,
535 East 70th Street,
New York, NY 10021, USA
e-mail: ntellisi@yahoo.co.uk

N. Tellisi · J. T. Deland, MD · S. R. Rozbruch, MD
Weill Medical College of Cornell University,
New York, NY 10065, USA

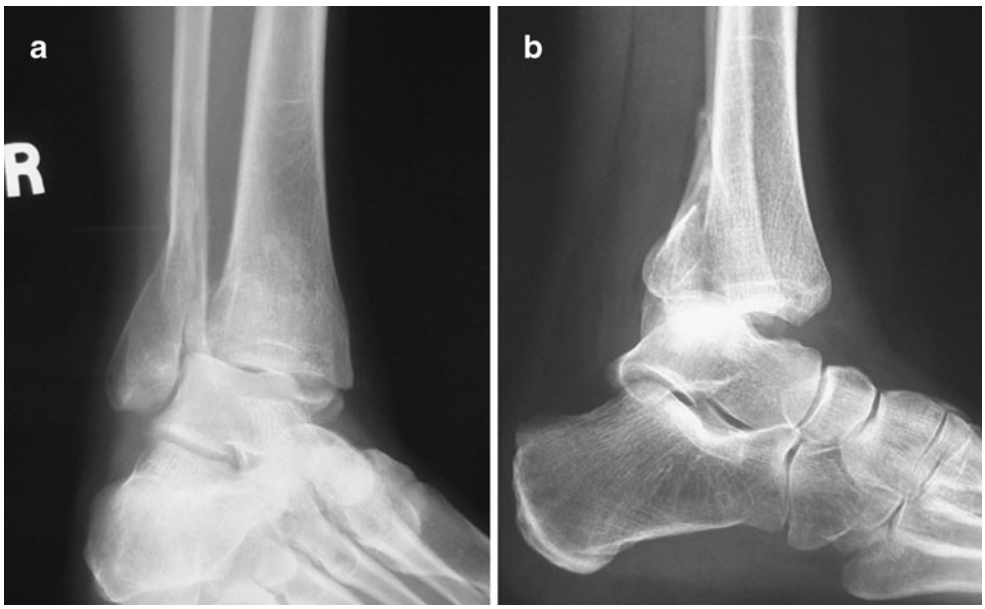

Fig. 1. **a** Preoperative mortise view of right ankle showing the degree of displacement. **b** Preoperative lateral view of the right ankle

foot. Tensioned 1.8-mm wires were used to stabilize the foot. This included a transverse calcaneal wire, a transverse mid-foot wire, two oblique calcaneal wires, and a talar wire. The struts were then applied between the two rings to stabilize the ankle. The ankle was still in a subluxated position at this time.

The plan was to reduce the ankle in stages, starting on postoperative day 2 and to distract at a rate of 1 mm per day. The initial correction was to lengthen across the ankle and distract 10 mm. Once she had completed her initial distraction phase and the talus had been moved distal to the tibial plafond, the remainder of the deformity was addressed. The next phase in adjustment was to correct the posterior translation, the equines, and the external rotation. When this was complete, the talus was relocated, and the posterior malleolus was reduced.

The second stage of treatment was insertion of internal fixation and removal of the frame. The posterior malleolus fragment was fixed percutaneously with two 4.5-mm screws. Through a lateral approach, the fibula was fixed with a seven-hole small fragment plate and screws and an interfragmentary lag screw (Fig. 3a–d).

Follow-up at 3 months showed satisfactory wound healing and bony union with restoration of the ankle joint alignment. At 2 years follow-up, the patient was mobile with mild ankle pain. The ankle range of motion was from neutral dorsiflexion to 20° of plantar flexion (Fig. 4a, b).

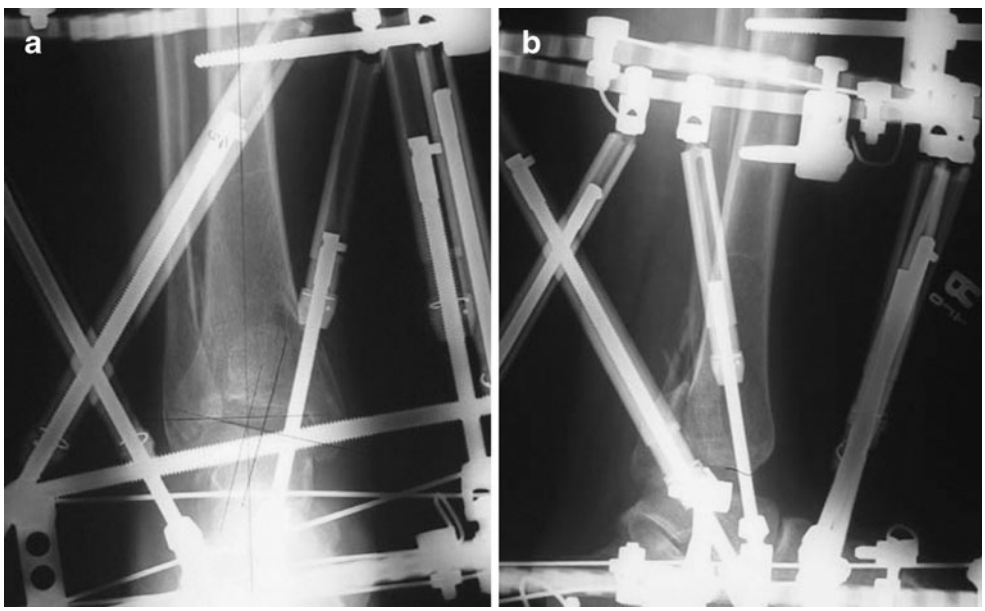

Fig. 2. **a** AP view of right ankle with full correction of the deformity following Taylor spatial frame application. **b** Lateral view of right ankle with full correction of the deformity following Taylor spatial frame application

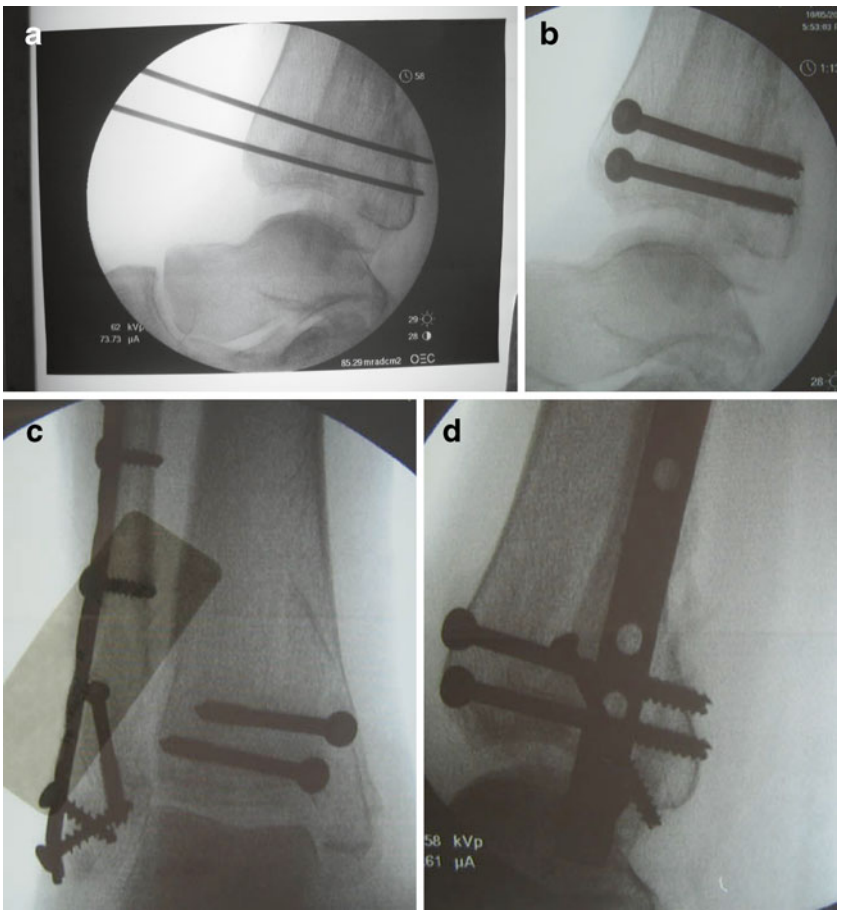

Fig. 3. **a** Intraoperative image of right ankle—lateral view showing percutaneous fixation of posterior malleolus. **b** Intraoperative image of right ankle—lateral view showing percutaneous fixation of posterior malleolus with two 4.5-mm screws are visualized. **c** Intraoperative image of right ankle after ORIF of fibular fracture—AP view. **d** Intraoperative image of right ankle after ORIF of fibular fracture—lateral view

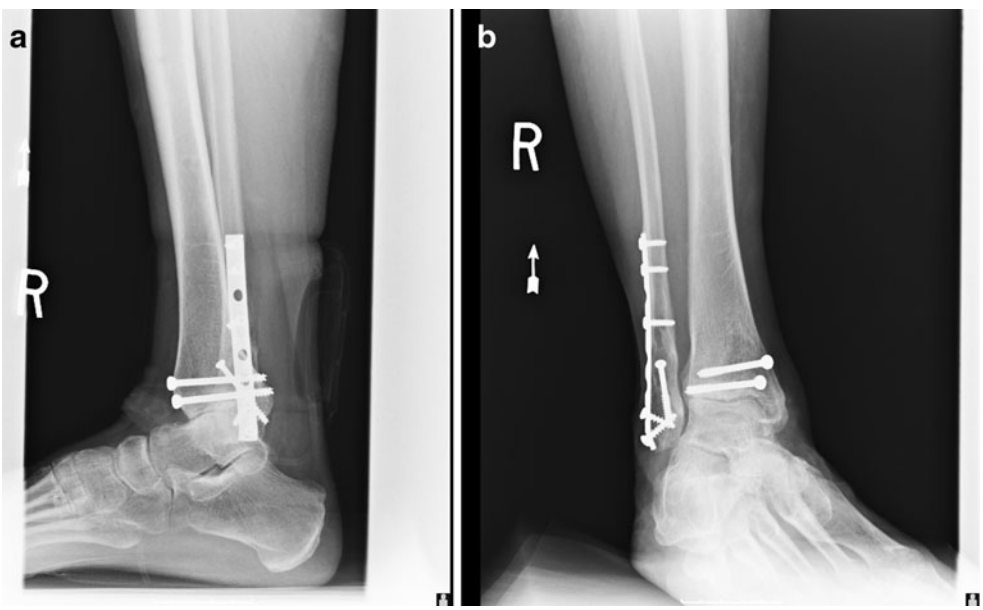

Fig. 4. **a** Lateral view of right ankle at 2 years follow-up. **b** AP view of right ankle at 2 years follow-up

Discussion

In this case report, the ankle fracture subluxation was neglected for 6 weeks after the injury until the time of presentation to us. The gradual reduction utilizing a TSF minimized the need for extensive soft tissue dissection and helped us achieve anatomical restoration of the ankle.

External fixation has been widely used for treatment of ankle trauma [6]. In this article, we describe a two-staged approach to treating a chronic fracture dislocation of the ankle utilizing a TSF to reduce the fracture followed by definitive open reduction internal fixation. It could be argued that the frame may have been used as definitive tool for the fracture repair by allowing an additional few months. The main concern, however, is the high risk of ankle stiffness and pin tract infections. For this reason, we felt that it was advantageous to remove the frame and internally fixate the ankle after the joint and bone reduction was achieved.

The major advantage of using the frame is that it is minimally invasive and limits the amount of damage on the ankle joint that may occur as result of open surgery. This technique helps achieve anatomical reduction in a mal-reduced and neglected ankle. The TSF was used because it allows the surgeon to gradually correct complex deformities. Six-axis deformity correction including both angulation and translation in the coronal, sagittal, and axial planes is then possible.

Achieving anatomical reduction has been shown to improve outcome even in delayed presentations [2]. It can also be argued that ankle distraction may have a long-term benefit in terms of cartilage regeneration, which has been reported with ankle distraction utilizing external fixators [1, 10]. In our view, this technique is extremely useful to utilize in treating complex fractures, with minimal complications. While this patient is at risk for developing posttraumatic arthritis, this approach can help restore the architecture of the ankle joint and its alignment. This will also facilitate ankle arthroplasty or fusion that might be required in the future. This technique permits reduction of the ankle when that reduction cannot be achieved acutely.

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